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Anaesthesia in Obstetrics*

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Anaesthesia for obstetrical cases is regarded by the general practitioner and occasionally even by the anaesthetist with great respect and a certain amount of fear; and rightly so, for in the hands of an inexperienced practitioner grave complications may occur to either the mother, the baby, or both. These difficulties do not arise when the anaesthetic is administered before the onset of labour, but once labour has become well established in the second stage, the anaesthetic becomes a more serious undertaking, and a certain amount of skill is required of the anaesthetist, together with a basic knowledge of the pharmacological and physiological properties of the various agents employed in anaesthesia. This article will not deal with the subject of analgesia in obstetrics but with anaesthesia for the more major obstetrical operations, and will, it is trusted, be of some guidance to those practitioners who may be landed with an obstetrical emergency and must administer an anaesthetic to a patient who is, more often than not, wholly unprepared for such administration, having just partaken of a meal, or whose stomach is full of glucose water which is so unfailingly given to women throughout labour!

The subject has been divided arbitrarily into three groups, viz.

1. Anaesthesia before the onset of labour.
2. Anaesthesia during labour.
3. Anaesthesia after delivery of the baby.

Group 1.—This group includes external version, induction of labour and other surgical conditions which may complicate pregnancy, e.g., appendicitis, torsion of ovarian cyst, etc. It also includes the so-called "cold" Caesarean section, but this will be dealt with in detail under a separate heading.

No special anaesthetic problem is presented by these cases. It might be opportune to state here that the general practitioner has an advantage over the specialist anaesthetist of being better able to anaesthetise for an external version because he will use chloroform, which is the only agent which will relax the uterine muscle and with which few specialist anaesthetists are to-day familiar!

Group 2.—This group comprises emergency Caesarean section, forceps extraction, internal version and destructive operations of the foetus. These conditions provide serious anaesthetic problems and will be discussed in detail later.

Group 3.—In this group retained placenta, repair of episiotomy and ruptured uterus are included. This group poses no special problem, as the baby need not be taken into consideration. Certain of these cases are often shocked from loss of blood, so that anaesthetics must be administered with great caution.

Some of the preceding conditions present great anaesthetic problems, and Caesarean section and forceps extraction will be more fully discussed.

SOME GENERAL CONSIDERATIONS

Premedication

As these two conditions so often necessitate emergency measures, the only premedication advised is atropine 1-100 gr., intramuscular injection, ensuring a more rapid action than the subcutaneous route. Barbiturates and morphine derivatives are contraindicated as premedicants owing to their markedly depressant effects on the foetus. In "cold" cases a small dose of pethidine (50 mg.) may be given with the atropine, but larger doses may cause foetal depression. Recently Largactil and Phenergan have been introduced as premedicant drugs with good results and no foetal depression. These drugs may be given singly or together in doses of 25 to 50 mg. two hours before operation.

The anaesthetic selected should fulfil the following criteria:—

(1) It must not cause foetal apnoea.
(2) It must not cause paralysis of uterine muscle (thus deep chloroform anaesthesia is contraindicated).
(3) It must not cause toxic effects in the mother.
(4) It must produce adequate abdominal relaxation.

Caesarean Section

1. *Inhalation Anaesthetics.*—All inhalation anaesthetics pass the placental barrier so that the length of time between the start of the anaesthetic and the extraction of the baby is important in the causation of foetal apnoea.

Nitrous Oxide is useful as an induction agent. It is better used in combination with cyclopropane and oxygen in order to prevent anoxia. This may be followed by ether and is probably the safest combination for the non-specialist anaesthetist.

Chloroform.—In the larger centres this is almost never used for Caesarean section. In the smaller outstations, however, it is commonly employed because of its easy administration by open mask. It is markedly toxic, and yellow atrophy of the liver has been reported some weeks after the administration of chloroform. Its incompatibility with adrenaline and pitressin should be

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remembered, as ventricular fibrillation can occur when it is used in combination with these drugs.

Cyclopropane.—Induction and maintenance with this gas are very good, but it is also a powerful foetal depressant. The main disadvantage is "cyclopropane shock" which may occur at the end of the operation and which can end fatally if not promptly treated with intravenous saline and vasopressor drugs such as Methedrine. It is also incompatible with adrenaline and pitressin, and some cases of fatal cardiac arrest have been reported after the use of cyclopropane in conjunction with a Pitoin drip used to initiate labour.[1, 2]

2. *Spinal Anaesthesia.*—The nerve supply to the uterus arrives from first and second lumbar sympathetic segments,[3] but the cervix derives its sympathetic supply from thoracic 10-11. The segmental nerve supply to the skin at umbilicus level is thoracic 10. For adequate spinal anaesthesia, therefore, the level of anaesthesia must be as high as thoracic 8, which means that the lower intercostal muscles are paralysed and, together with the enlarged uterus which also interferes with respiratory movement, the mother will experience a fair amount of dyspnoea under spinal anaesthesia. It is thus essential to supply the mother with oxygen during the Caesarean section.

Spinal anaesthesia causes a fall in the systolic blood pressure, and a systolic pressure below 80 mm. mercury can result in failure of placental circulation and death of the foetus. It is of prime importance to administer some vasopressor drug like Methedrine to prevent this fall in blood pressure. Spinal anaesthesia provides ideal operative conditions—a contracted uterus, little bleeding, relaxed abdominal muscles and, most important, no foetal depression.

3. *Caudal Anaesthesia.*—This consists of injecting a local anaesthetic agent like procaine into the sacral canal through the inferior sacral hiatus. The dura mater with cerebrospinal extends to the lower end of the second sacral segment, so that care must be taken not to advance the needle higher than the third sacral vertebra for fear of puncturing the dura and injecting a lethal dose of local anaesthetic into the cerebrospinal fluid.

This is actually an extra-dural anaesthesia as distinct from the subarachnoid technique of spinal anaesthesia. The advantage lies in the fact that there is no appreciable fall in blood pressure, as the sympathetic fibres or connector cells are not directly anaesthetised. However, there are some disadvantages, the technique is time-consuming, taking about half an hour to perform, and anatomical variations in patients often make it impossible to perform sacral puncture. As with spinal anaesthesia, the foetus is not depressed.

4. *Regional and Local Infiltration.*—This is probably the safest anaesthetic for both mother and foetus, but somewhat of a nuisance for either the surgeon or anaesthetist, whichever of the two must inject the local anaesthetic. Adequate anaesthesia may be obtained by infiltrating each layer of the skin downwards. This should be accompanied by infiltration of the outer border of the rectus sheath on both sides to anaesthetise the intercostal nerves as they enter the rectus sheath. Regional infiltration may be accompanied by light general anaesthesia with nitrous oxide or cyclopropane. Unless a qualified anaesthetist is available, this technique should be reserved for very ill patients who will not tolerate a general anaesthetic.

5. *Intravenous Anaesthesia.*—(a) *Barbiturates*: Seldom has there been so much controversy among anaesthetists, and obstetricians, as to whether Thiopentone should be used in obstetrics. Many obstetricians forbid its use entirely. It is very pleasant for the mother and makes the anaesthetist's lot much easier, but it passes the placental barrier and causes marked foetal depression. However, if used carefully and with a little co-operation from both the mother and the surgeon, no more cases of foetal apnoea occur than with other anaesthetic agents. I have seldom had a case of foetal apnoea when using Thiopentone, whereas many babies have required some resuscitation after nitrous oxide, ether or cyclopropane anaesthesia. There are many conflicting reports as to the time taken for Thiopentone to pass through the placenta in concentration sufficient to depress the respiratory centre of the foetus. The generally accepted time is seven minutes, but McKechnie and Converse[4] carried out a number of blood estimations of Thiopentone in both mother and baby during and after Caesarean section and found that after three minutes the concentration of Thiopentone in mother and baby are almost equal.

From personal experience I find that if the foetus is extracted within seven minutes, apnoea is rarely present. My technique is as follows: The mother is brought into the operating theatre and informed that the anaesthetic will not commence until the surgeon is ready, and she is towelled so that as little Thiopentone as possible can reach the baby. The mother is very co-operative once she understands the reasons; 0.3 g. Thiopentone with 15 mgm. Tubo-curarine (Tubarine) is injected rapidly intravenously and cyclopropane and oxygen 20%: 80% is adminis-

tered. Assisted respiration is given if necessary. As soon as the patient has lost consciousness the surgeon is told to begin. The average time for extraction of the baby is four minutes (lower segment operation) and the baby usually cries as soon as the head is delivered. I have seldom had occasion to resuscitate a baby delivered by this technique. The amount of Thiopentone injected is important and never more than 0.5 g. should be given, as the bigger the dose the quicker its placental transmission. In a very interesting review by Ozinsky and Harrison [5] they show that no matter what type of anaesthesia is used, whether intravenous, inhalation or the two combined, the factor controlling foetal apnoea is the time taken to extract the foetus, and they find that 20 minutes is the maximum time that can safely be taken before foetal apnoea occurs.

(b) *Relaxants*: Since the introduction of the relaxant drugs into anaesthesia there has been much discussion as to their placental transmission. Pittinger and Morris [6] in a series of cases state that Scoline passes readily, Flaxedil and Curare a little and Decamethonium not at all. From personal experience with the use of both Tubo-curarine and Flaxedil no baby born has shown signs of curarisation after the use of these preparations. Relaxants are employed to allow abdominal muscle relaxation and prevent the laryngeal stridor often associated with light plane general anaesthesia which is required for Caesarean section.

FORCEPS EXTRACTION

The application of forceps for the extraction of the foetus is invariably performed only after the mother has been in labour for some time and the course of labour is not progressing satisfactorily. The mother is usually not prepared for the administration of an anaesthetic, has probably had a meal within the past few hours and has been exhorted by the midwife to drink copious draughts of glucose water. Such cases, as do emergency Caesarean sections or internal versions, present a very serious anaesthetic problem and in the hands of inexperienced anaesthetists may result in serious, if not fatal, complications. The chief danger is vomiting and aspiration of contents from a stomach whose emptying time has already been slowed up by the process of labour. This question of vomiting is so important that I will deal with it separately when discussing the hazards of obstetric anaesthesia. In these cases intravenous anaesthesia is definitely contraindicated for two reasons:

(1) It causes regurgitation of gastric contents by relaxing the cardiac sphincter—so dangerous because the spasmodic movements associated with vomiting are absent and so making the anaesthetist unaware of the presence of vomitus in the nasopharynx.

(2) As forceps are so often applied to the foetal head high in the pelvis, the baby will be badly anoxic by the time it has been extracted.

For these emergency cases inhalation anaesthesia should be employed. Both spinal and caudal anaesthesia will be difficult to perform, as the patient will not be very co-operative and will move about with each pain. Chloroform induction with open mask ether maintenance is probably the safest for the occasional anaesthetist. Where no Boyle's apparatus is available, a useful anaesthetic is a mixture of one part chloroform to two parts ether, a much safer mixture than pure chloroform, and this is administered by the open mask and drip bottle method. It is important to give a little oxygen under the mask if chloroform is used, as the cardiac toxicity of chloroform is due to anoxia.

ANAESTHETIC HAZARDS IN OBSTETRICS AND THEIR PREVENTION [7]

Deaths have occurred after the administration of anaesthetic for obstetrical cases, many of which might have been prevented had the necessary precautions been taken. In a review of 18,648 obstetric anaesthetics between 1935 and 1954 no immediate anaesthetic deaths occurred.[8] Yet of 1,733 maternal deaths, 45 (2.6 per cent.) were associated with anaesthesia.

Spinal shock caused the death of 11 of the 45 cases. This is caused by the fall in blood pressure associated with sympathetic paralysis and consequent cerebral and coronary anoxia. This can be prevented by the prophylactic use of methedrine 15 mgm. intramuscularly half an hour pre-operatively or in severe cases by the intravenous administration of methedrine 15-30 mgm. or Nor-adrenaline in a vacolitre of saline.

Cardiac arrest accounted for seven deaths. No causes for the cardiac arrest are stated, but are considered to be due to poor respiratory exchange. This may result from a spinal anaesthetic with intercostal paralysis or from overdose of an inhalation anaesthetic or muscle relaxant. It goes without saying that adequate oxygenation is of primary importance to ensure a live mother and baby. No cases are reported of death due

to sensitivity to *local anaesthetic agents,* but this possibility must be remembered. Weak anaesthetic solutions should be employed together with adrenaline to prevent too rapid absorption.

The major cause of death in this series is *aspiration* of foreign material into the respiratory tract due to vomiting after inhalation or intravenous anaesthesia. It must be remembered that the process of labour markedly delays the emptying time of the stomach from the normal four hours up to 24 hours. Of 330 maternal deaths resulting from anaesthesia, Hingson and Hellman [2] found that 155 were due to aspiration of vomitus. It is not only solid gastric contents which cause death, but most of the cases have been due to aspiration of liquid gastric contents. Mendelson [9] drew attention to the so-called "asthmatic condition" due to aspiration of liquid stomach contents, as distinct from pulmonary collapse resulting from inhalation of solid gastric contents. Parker [10] reported seven cases of aspiration, four of whom died from the "acid aspiration syndrome" and one from inhalation of solid vomitus. This acid aspiration syndrome does not produce symptoms immediately, but only on recovering from the anaesthetic. Cyanosis becomes marked, pulse rate increases, the patient is restless, breathing becomes rapid and shallower and eventually there is circulatory collapse and death may supervene.

To prevent these tragedies it is essential that the necessary equipment be present in the theatre and be readily accessible to deal with aspiration into the bronchial tree. This includes a laryngoscope, bronchoscope and sucker, all to be in good working order! The patient should be induced with the head of the table dropped or *the foot of the table raised.* Some anaesthetists routinely wash out the stomach before inducing anaesthesia, but solid material will not come out of the stomach tube and remains in the stomach as a potential danger. Mendelson has suggested the use of a transparent facepiece so that the vomitus may be immediately seen. Much discussion has recently taken place on the use of the lateral position for forceps delivery.[11] In this position the patient may be readily anaesthetised and any vomitus will naturally drain away from the air passages, but not many obstetricians are prepared to deliver the patients in this position and their co-operation in this matter will greatly facilitate the lot of the anaesthetist.

SUMMARY

1. Inhalational, intravenous, local and spinal anaesthetic agents have been discussed, with their advantages and disadvantages in obstetric practice.

2. The position of Thiopentone and muscle relaxant drugs in obstetric anaesthesia has been fully reviewed.

3. The hazards attending obstetric anaesthesia have been discussed, together with some recommendations for their prevention.

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